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ABSTRACT

The Wright State University Global Learning and Observations to Benefit the Environment (GLOBE) Franchise has developed a project to fill the need for direct, strong connections linking science, mathematics and technology to classroom curriculum and students' learning of integrated, relevant content. GLOBE is an international project that involves students and teachers in scientific investigations where their data are reported in an interactive Web site database. The Southern Ohio GLOBE Environmental Science Education Initiative fosters an awareness and understanding of environmental issues on a local scale, then on a more global, ecological level. GLOBE's long-term investigations, environmental parameters and issues allow students to be actively involved in data collection, analysis of data, graphic representation of data, leading them to better understanding of scientific process and methods. This paper describes the project and the summer workshop and provides insights into the impact GLOBE is having on students in grades 2-12 and their teachers in southwestern Ohio. (Author/YDS)

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Using the GLOBE Program to Enhance Classroom Teaching

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Using the GLOBE Program to Enhance Classroom Teaching

ABSTRACT
The Wright State University Global Learning and Observations to Benefit the Environment (GLOBE) Franchise has developed a project to fill the need for direct, strong connections linking science, mathematics and technology to classroom curriculum and students' learning of integrated, relevant content. GLOBE is an international project that involves students and teachers in scientific investigations where their data are reported in an interactive website database. The Southern Ohio GLOBE Environmental Science Education Initiative fosters an awareness and understanding of environmental issues on a local scale, then on a more global, ecological level. GLOBE long term investigations environmental parameters and issues allow students to be actively involved in data collection, analysis of data, graphic representation of data, leading to better understanding of scientific process and methods. This session describes the project, the summer workshop and provides insights into the impact GLOBE is having on teachers and students in grades 2 – 12 in southwestern Ohio.

Introduction

Modern industrial civilization, as presently organized, is colliding, violently with our planet's ecological system. The ferocity of its assault on the earth is breathtaking, and the horrific consequences are occurring so quickly as to defy our capacity to recognize them, comprehend their global implications, and organize an appropriate and timely response (p. 269, Gore, 1993).

Environmental science education (ESE) addresses the need for a more integrated approach to science learning about the natural world as well as fostering creative and realistic problem solving skills. ESE, being an integration of several disciplines, lends itself to open-ended investigation and to teaching science concepts in a connected, meaningful manner. The integrated nature of ESE also readily lends itself to teaching and learning in a multitude of subject areas, in using a thematic approach, and drawing upon multiple intelligences (Gardner 1983; 1993) and varied learning styles of students and teachers alike. Another benefit of a sound ESE curricular emphasis in schools is the inclusive

nature of this type of hands-on science investigation--as stated repeatedly in the science education reform literature--science needs to be for all students. This is by virtue of the attributes of ESE, a greater number of students are reached and actively involved in environmental science learning.

The WSU GLOBE Project

There is the need for direct, strong connections linking science as it is taught as classroom curriculum with environmental outdoor field trips, and assessment such as the Ohio Science Proficiency Outcomes testing. Several Ohio Science Proficiency Outcomes test questions refer to environmental science concepts, such as renewable versus nonrenewable resources, and the dynamics of food webs, within such contexts, students are expected to analyze and interpret data and think critically about the information presented. Quality ESE programs bring sound understanding of environmental concepts into day to day classroom teaching by including meaningful integration of science, mathematics and technology, with other areas of learning. Long term investigations (such as those in the Global Learning and Observation to Benefit the Environment (GLOBE) program (Finarelli, 1998)) allow students to be actively involved in research. Students are collecting and analyzing data, using graphic representation of data and other investigative skills which lead to a clearer understanding of the scientific process and methods while gaining understanding of environmental parameters and issues. Teachers and their students benefit from far-reaching programs like GLOBE in that inclusion in this network helps them to develop conceptual understanding of environmental issues and to sharpen critical thinking and problem-solving skills.

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This approach to learning increases the likelihood of student involvement in a proactive, solution-oriented approach to conservation and preservation of earth's natural resources. The Wright State University (WSU) Southern Ohio GLOBE Environmental Science Education Initiative (SOGESEI) provides an in-depth understanding of the global nature and complexity of environmental issues. The GLOBE protocols and curricular materials bring content and procedural knowledge of environmental scientific protocols for atmospheric/climate, land cover, hydrology, and soils data collection and internet data reporting into the K-12 classroom setting. This data is entered and compiled with the existing GLOBE data from over 4,000 GLOBE school sites throughout the U. S. and 62 other countries worldwide. This collaborative project draws together resources and expertise of several key environmental educators and institutions in the southern Ohio area. Project facilitators brought complementary areas of expertise to the summer institute, providing teacher training in a variety of environmental protocol areas, acting as a resource for the various research investigations, and assisting the teacher participants in establishing their GLOBE school site, and implementing data collection and use in classrooms.

The primary objective of SOGESEI project has been to provide 28 classroom teachers with the necessary in-depth background and understanding of critical environmental issues coupled with the scientific knowledge to conduct GLOBE protocol data collection and recording with their students. Through inquiry-based science education lessons and long term investigations appropriate for their grade level, teacher participants have used these experiences to translate and extend their students' understanding of the

complexity of environmental ecology. High quality interactive presentation of curricula and materials, such as the GLOBE program, coupled with year long support and follow-up is a proven model for teacher professional development for implementing change in science education (Ramey-Gassert, Shroyer, Staver, 1996).

Teacher teams from schools throughout Ohio were selected to participate in this project. They received GLOBE material kits containing the necessary equipment to conduct classroom-based environmental research and data collection, attended a one-week institute, and will attend follow-up meetings periodically throughout the academic year for additional professional development. In addition, each participant has had site visits to their schools to assist with the implementation of the program and for additional support throughout the year.

Connecting Course Development and Teacher Professional Development

In an effort to help teachers construct the pedagogical skills, curriculum knowledge, and attitudes and dispositions necessary to educate all students, university and/or site-based courses and partner school inservice programs such as Project Discovery and SOGESEI have been constructed to exemplify good science and mathematics teaching. These courses teach the content, model exemplary pedagogy that the recent science education standards state are necessary to create valuable and practical learning episodes to support excellence and equity for precollege students. Moreover, student understandings are acquired within an active and constructivist, inquiry-based framework designed to enable students to witness science and science education faculty "walking the walk and not just talking the talk".

Working with both preservice and now inservice teachers in our science courses, creates greater potential for blending science education theory with effective teaching practices in the classroom, benefiting students and teachers alike. Presently we are exploring ways to match the preservice teachers' field experiences--from the initial early observational phase, to internships/student teaching--with inservice teachers who have been immersed in our expanded science course offerings.

Six new courses are currently being designed for middle level education majors with a concentration in science in response to the new middle level licensure law in Ohio and to the learned society recommendations for middle level science educator preparation. These new courses will provide additional experience in each discipline, as well as, an opportunity for extended integrated ESE investigations. These additional courses will aid in meeting the needs of our preservice teachers not only in middle level content knowledge, but also in implementing the teaching practices modeled in these courses and recommended by the standards.

Bringing Preservice and Inservice Teachers Together

Much of the feedback concerning our science education sequence comes from students during their student teaching experience. One impact that has been noted is the wide-ranging use of hands-on materials and inquiry-based lesson plans developed in the science content courses and science methods courses. This use of materials and lesson plans by our students is impacting K-12 students in classrooms, as well as the cooperating teachers. The inservice teachers ask student teachers for copies of lesson plans and/or where they can obtain the materials. With this, inservice teachers learn about the university

science education program as they see how a constructivist approach to science teaching works with their class. This, of course, benefits K-12 students, preservice, and inservice teachers by reinforcing a constructivist, inquiry-based approach to science teaching in a learning environment.

Another result of both pre- and inservice science education programs has been the recruitment of efficacious inservice teachers to teach site-based science methods courses in partnership schools. The sequence of the programs has been designed to systematically provide science education experiences that build knowledge and understanding of constructivist science teaching principles and pedagogy for preservice and inservice teachers while expanding the learning experience to impact the classrooms in the region. With a cadre of teachers, both the graduate preservice teachers and other inservice teachers who have attended science professional development programs, we are beginning to see the positive impacts. This is evidenced by successful student teachers who are teaching science in a constructivist manner, all the way to classroom teachers who are now adjuncts teaching science methods courses because they have seen firsthand the outcome of inquiry-based science teaching with their K-12 students.

The following quotes provide evidence of one such placement where a student teacher was placed with an inservice teacher who adopted a constructivist approach to teaching following her participation in several Project Discovery professional development science and mathematics courses in our program.

Student Teacher: As I embarked on my student teaching assignment, I was anxious but leery to implement techniques I had learned in my undergraduate studies. I had the fortunate opportunity to work with an energetic, hands-on, inquiry based teacher who paved the way for me to successfully apply my college education. From the first day of school, she instilled in her students the

fact that she was not the "giver of information." She was the facilitator. She modeled for me, with her class of 5th graders, what I had only seen modeled on college students. It was proof positive for me that what I had learned at WSU actually worked in the real world. With the stage set by my cooperating teacher, my job was easy. I successfully implemented lessons using the discovery method of learning.

Teacher: Building a constructivist classroom means a change in attitude about my role as a teacher. For years I have been taught that the teacher should be the facilitator of learning, not the transmitter of knowledge, yet I fell into the trap of believing that because I did lots of hands-on activities with my class, I was a true facilitator. It never occurred to me that doing a demonstration, reading the chapter and doing a "neat" activity wasn't really changing my role.

Teacher: A constructivist classroom recognizes the importance of activities that help students interpret the "real" world. This kind of learning can only take place in a natural environment where students are allowed to experience the process of inquiry. One of the most valuable things I learned during my work in Project Discovery is the power of having living organisms in my room. Over the years I have rarely had classroom pets (I am a city girl) and never used them for any learning activities. I now have a menagerie of organisms from leeches to rabbits and am amazed at what is happening in my classroom. Students have learned to respect living creatures in a way I would have never thought possible. In addition, they have learned responsibility in caring for the animals. (Each animal station requires feeding, cleaning, or some other task. A team of students is responsible for each station.) Students are seeing the food chain in action and are designing experiments to learn new information about the animals. The time that students spend is worth it.

A Final Comment

As we continue our program development and modification our science courses to allow classroom teachers opportunities to learn content while updating their understanding of science education pedagogy, one continuing concern is staffing these courses. The challenge is to find faculty who are knowledgeable in inquiry and cooperative learning strategies, as well as, having an in-depth science content understanding to confidently handle the open environment of the constructivist classroom. This staffing concern has already arisen in maintaining the core courses and has been partially addressed by utilizing inservice Master teachers, like the one quoted herein, as faculty. These

teachers all have had substantive professional development experiences in science that were sustained for at least one year, emphasized standards-based curricula and enhancement of content knowledge, and provided in-depth coverage of science content while modeling inquiry, problem-solving, and cooperative grouping techniques. These Master teachers bring not only their deep content and pedagogical knowledge to the preservice teachers, but also their rich classroom experience. As discussed above, the science education, and the middle level program in particular, continues to evolve and grow while enriching the teaching and learning of preservice as well as inservice teachers in area schools.

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